

Integrated Water Quality and Aquatic Communities Protocol – Wadeable Streams

Standard Operating Procedure (SOP) #15: Aquatic Vertebrate Sampling

Draft Version 1.0

Revision History Log:

Previous Version	Revision Date	Author	Changes Made	Reason for Change	New Version

This SOP explains the procedure for the collection and identification of aquatic vertebrates such as newts, salamanders, frogs, crayfishes (although they are invertebrates, crayfish collection and identification is done using this protocol due to their size and susceptibility to electrofishing), and fishes. The object is to collect, identify, measure, and return the organisms back into their environment with minimal harm to the organisms. Preparation and sampling efficiency is necessary to reduce the handling time of these organisms thereby reducing the likelihood of harm to them. Each organism that is collected should be treated with the utmost amount of care and respect, as if it were the crew member's own family pet.

The procedure presented here is based upon methods that proved most efficient during the pilot study. It was found that sampling half of the total sample reach and processing the collected organisms in two batches was the most efficient. However for larger reaches or reaches with abundant fish, it may be necessary to break up the sampling and processing of organisms into additional batches in order to complete effectively while minimizing risk of injury/ mortality to collected organisms.

The handling of specimens should at all times conform to the policy of the American Society of Ichthyologists and Herpetologists guidelines for the use of fish, amphibians and reptiles in research (Appendix L).

Electrofishing Safety

Electrofishing units have the capacity to deliver a powerful, potentially fatal shock to a crew member if proper caution is not exercised. Primary responsibility for safety while electrofishing rests with the Crew Leader; however, all crew members have the responsibility to identify and avoid potentially dangerous situations. Nonetheless, all crew members must read and follow all directions and guidelines presented in the operational manual for the electrofishing unit (Appendix R) and the Job Hazard Analyses (Appendix N) before conducting this activity. Crew members should keep each other in constant view and communicate all activities while

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electrofishing. The crew member operating the electrofishing unit should constantly verbalize his/her actions (i.e., communicate, communicate, communicate) so that all crew members are aware of his/her intentions while electrofishing. While electrofishing, avoid contact with the water unless sufficiently insulated against electroshock. Use chest waders, thick rubber gloves, and proper non-slip footwear to reduce the potential for electroshock. If it is necessary for a team member to reach into the water to pick up a fish or a dropped item, do so only after the electric current is off and the anode has been removed from the water. Do not resume electrofishing until all crew members are clear of the electroshock hazard. Avoid direct contact with the anode and cathode of the electrofishing unit at all times due to the potentially severe shock hazard. Do not electrofish during rain events, as this will increase the potential for electroshock. Do not electrofish near other electronic sampling devices, as this may affect measurements or potentially damage instruments.

Pre-sampling Preparations

1. Create a fish processing area near the X-Point of the stream. Unpack identification keys, measuring board, five-gallon buckets, and aeration devices necessary for fish processing.
2. Take two 5 gallon buckets and half fill them with stream water. Attach battery powered aeration devices to the buckets and turn them on so that the water will begin saturating with oxygen. These buckets will serve as live-wells for collected fish. Place these buckets near Transects B and D so that as fish are collected, they can be quickly deposited into these live-wells. The buckets should be placed in a shady area, preferably within the stream, to prevent water temperature increase that could potentially harm collected organisms. Ensure they are secured with rocks or other anchorage. If an organism is collected that is too large to be safely contained in the live-well, immediately identify, measure, and release the organism far enough downstream to eliminate the possibility of re-capturing the released organism.
3. Don all necessary gear for electrofishing, including rubber gloves, chest waders, hats, and polarized sunglasses (hats and polarized sunglasses greatly increase sampling efficiency by reducing glare and allowing a better view into the aquatic environment). Polarized sunglasses tend to be expensive; a retaining strap is recommended.
4. Assemble nets and electrofishing gear. Turn on and test the electrofishing unit according to manufacturer's instructions. Set the voltage, pulse rate, and duty cycle of the unit (typical settings for the pilot study were between 200-600 volts, 60 Hz pulse rate, and 25% duty cycle on Pulsed DC mode, although these settings can vary greatly depending upon the unique water chemistry of each stream) and reset the trigger time counter.

Electrofishing

1. The fish sampling crew has three primary positions: (1) electrofisher operator, (2) primary netter, and (3) secondary netter. Crew members may switch responsibilities at different stream reaches as long as sampling effort and collection techniques stay roughly constant during each sampling event. If extra help is available (e.g., park observers), they can be incorporated into the sampling as extra netters.
 - a. The electrofisher operator carries the electrofishing unit, coordinates all sampling activities, and chooses the path and habitats that are to be sampled using the electrofisher.

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- b. The primary netter should be the primary collector of stunned organisms and carries only the insulated dip net. He/she should follow closely behind the Electrofisher operator, keeping his/her net submerged about a meter directly behind the electrofishing unit's anode.
 - c. The secondary netter carries a 5 gallon bucket with stream water for transportation of collected fishes as well as an insulated dip net. Any fishes that evade capture by the primary netter are the responsibility of the secondary netter. The secondary netter also transports collected organisms to the live-wells when the collection bucket begins to fill. If a multitude of organisms are being stunned in a particular habitat, the secondary netter should place the collection bucket in a safe location and aid in the capture of organisms to increase sampling efficiency.
2. Once the settings on the electrofisher are adjusted properly to sample effectively and minimize injury and mortality and all pre-sampling preparations are completed, begin sampling at the downstream end of the reach (Transect A) and fish in an upstream direction. This is done so that the current forces stunned organisms downstream towards the nets.
 - a. Depress the switch and slowly sweep the electrode from side to side in the water in riffles and pools. Focus on submerged fish cover, such as boulders, logs, and undercuts.
 - b. Move the anode wand into cover with the current on and then remove the wand quickly to draw fish out. Fish are often drawn towards the anode when stunned. In fast moving, shallow water, sweep the anode and fish downstream into a net.
 - c. The netters should strategically place themselves so that stunned fish can quickly be netted.
 - d. In extremely wide streams, work from the midline of the stream channel to the banks.
 - e. Be sure that deep, shallow, fast, slow, complex, and simple habitats are all sampled. In stretches with deep pools, fish the margins of the pool as much as possible, being extremely careful not to step or slide into deep water.
 - f. Continue fishing in this manner until the electrofishing crew reaches the fish processing area near the X-Point.
3. Stop electrofishing; retrieve the live-wells and all collected organisms; and transport them to the processing area for identification, enumeration, and measurement.
 - a. Start by processing any federally or state listed specimens first.
 - b. Record the common name for each organism identified. If an organism is unidentifiable in the field, take multiple pictures of defining characteristics of that organism so that it can be identified later using these pictures as a reference (SOP #16: Photo Points and Photo Management).
 - c. Measure the largest and smallest of each identified organism and record the minimum and maximum length range (total length for fish; Snout-Tail Length for amphibians) on the datasheet or in the database.
 - d. If any external anomalies (e.g., tumors, missing appendages, or other abnormalities) are found on the collected organisms, record how many organisms had external anomalies in the "Anomaly Count" column and make note of the type of anomaly in the "Comments" section of the datasheet.

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4. Fill in the bubbles next to the transects near where each organism was collected in order to give a distribution of that organism within the sample reach. Once processing of the first half of collected fish has been completed, release these fish downstream of the processing area, far enough to eliminate the possibility of re-capturing the released organisms (approximately 25 meters). Refill the live-wells with stream water and place them near Transects G and I in the same manner as previously described.
5. Repeat steps 2 and 3 for the area from the X-Point to Transect K at the upstream limit of the sampling reach.
6. Record the electrofishing unit's settings and the total amount of trigger time on the datasheet. In some instances when fishing in deeper/shallower habitats, it may be necessary to increase/decrease the voltage to improve sampling efficiency. If more than one setting was used during the course of sampling, be sure to include the range of settings used.

Visual Encounter Surveys

Visual encounter surveys (VES) supplement is a basic technique to sample for amphibians. While it is usually a timed search, here we use it as a basic technique to supplement the electrofishing of fish and amphibians. As the crews walk up and down the stream reach doing other sampling activities, they should opportunistically keep their eyes and ears open for other signs of amphibians. Sightings should be recorded as above on the datasheets or in the database. Unknown specimens should be photo vouchered as above.